Watershed Sub-committee

SR522 Results Presentation:

- Summarize Transportation Impacts
- Characterize Condition of Processes
- Identify Target Landscape Areas
- Identify Local Priority Resource Areas

Watershed Sub-committee

SR522 Results Presentation:

- Identify Candidate Mitigation Sites
- Provide Priority Mitigation Options
- Provide SR 522 Lessons Learned

Summary of Watershed Characterization

- **Part I –** Project Site Assessment
- **Part II –** Characterize Conditions and Identify Potential Mitigation Options
- **Part III –** Identify and Assess Potential Mitigation Sites

Summary of Part I – Impact Assessment

1. Loss of 35 acre-feet of water storage
2. Increased loading rates for suspended sediments and heavy metals.
3. 1.85 acres of wetlands degraded or destroyed

Summary of Part II, Steps 1 through 3

- **Step 1 –** Establish Spatial Scales
- **Step 2 –** Establish Temporal Scales
- **Step 3 –** Characterize Resource Condition and Process Drivers within the Assessment Area

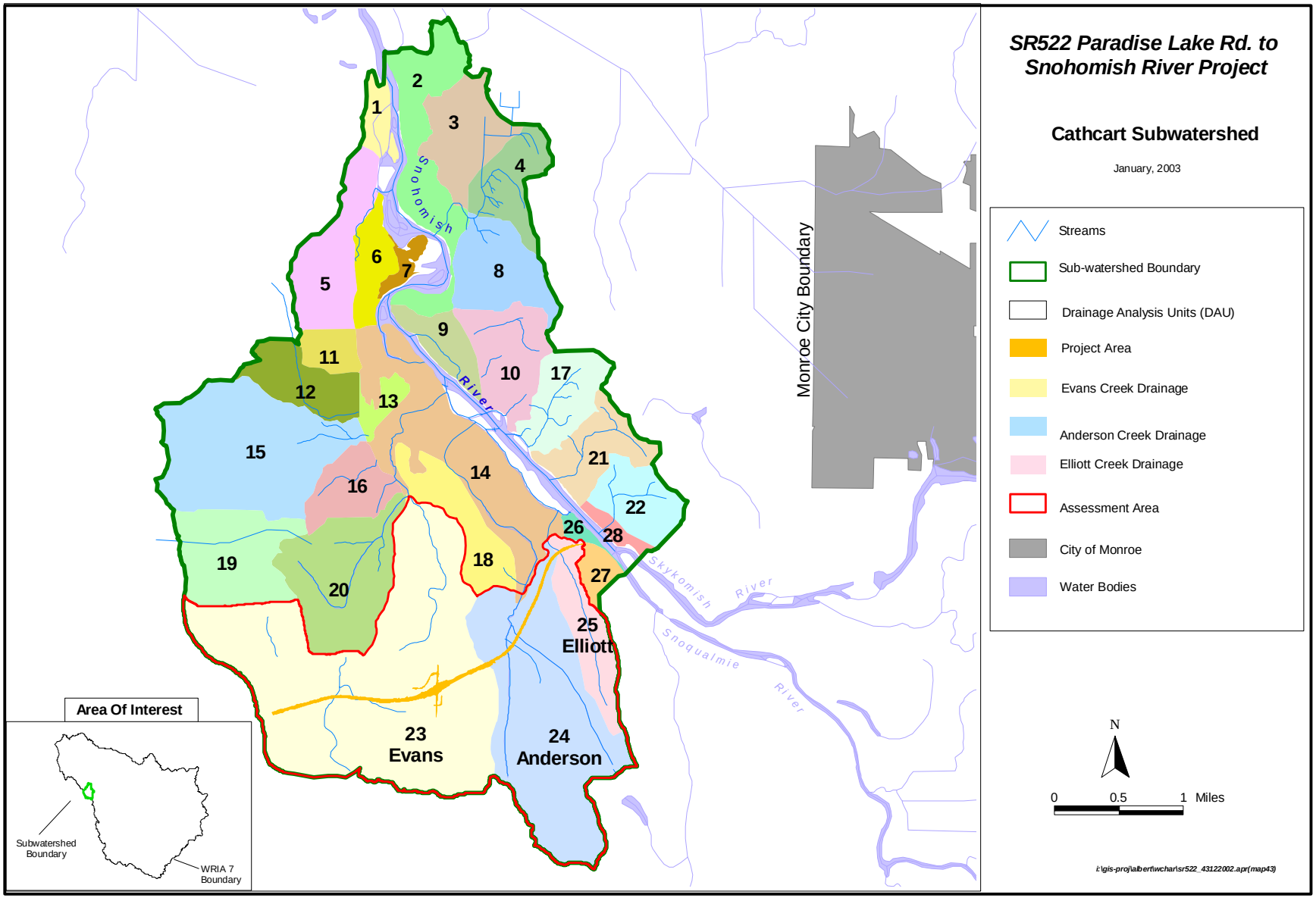
Part II, Step 4

Characterize Condition of Ecological Processes

Part II, Step 4
Characterize Condition

Methods

1. Sub-divide composite sub-watershed into 188 (200 to 2000 acre) Drainage Analysis Units using:
   - 10 meter DEM
   - Floodplain features


SR522 Paradise Lake Rd. to Snohomish River Project
Cathcart Subwatershed
January, 2003
Streams
Sub-watershed Boundary
Drainage Analysis Units (DAU)
Project Area
Evans Creek Drainage
Anderson Creek Drainage
Elliott Creek Drainage
Assessment Area
City of Monroe
Water Bodies
Monroe City Boundary
Snohomish River
Skykomish River
Snoqualmie River
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23 Evans
24 Anderson
25 Elliott
26
27
28
Area Of Interest
Subwatershed Boundary
WRIA 7 Boundary
N
0
0.5
1 Miles
i:\gis-proj\albert\wchar\sr522_43122002.apr(map43)

Part II, Step 4
Characterize Condition

Methods

2. Establish landscape indicators used to characterize condition of DAUs

Landscape indicators will require technical documentation and policy concurrence.

Part II, Step 4
Characterize Condition

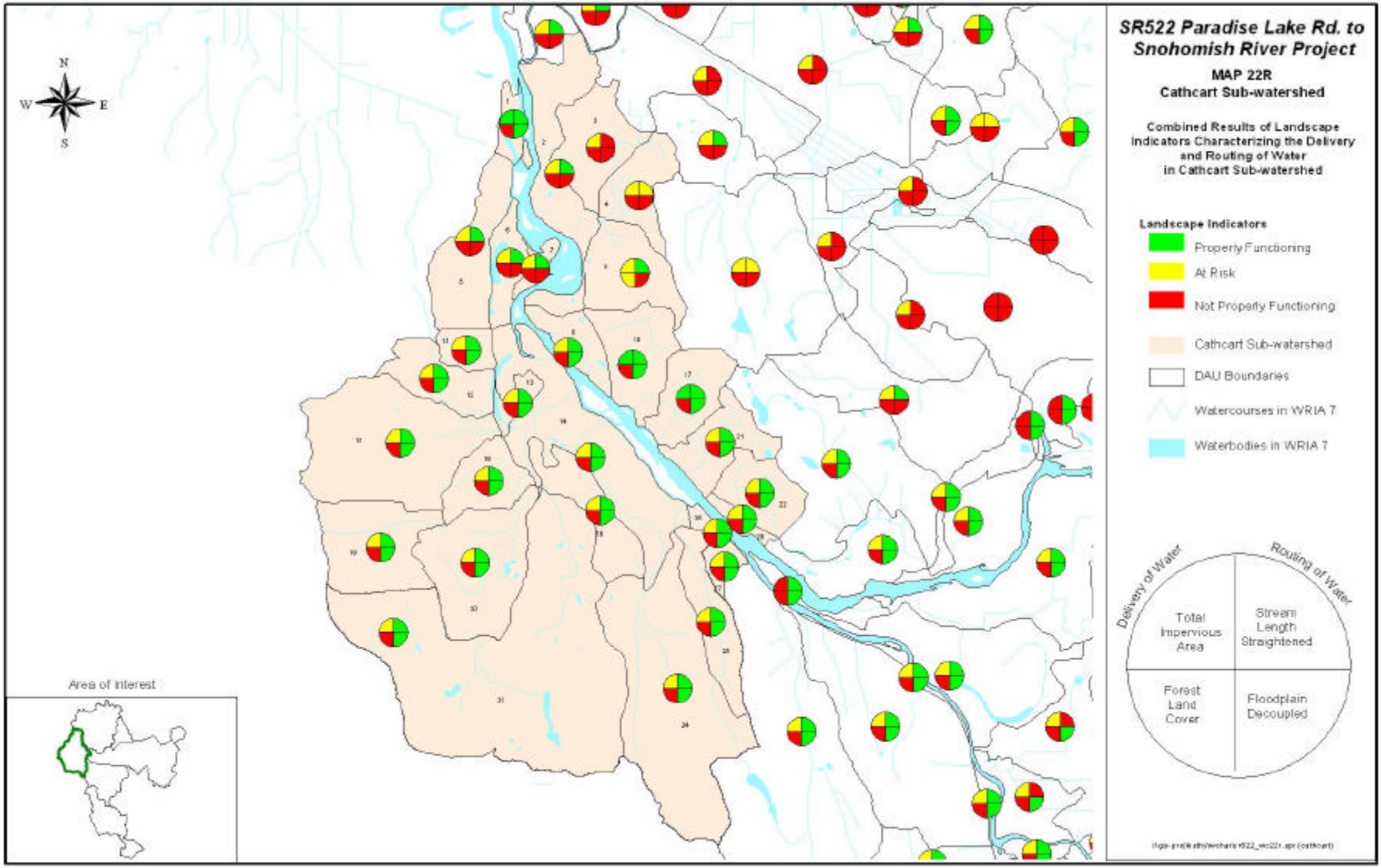
Methods

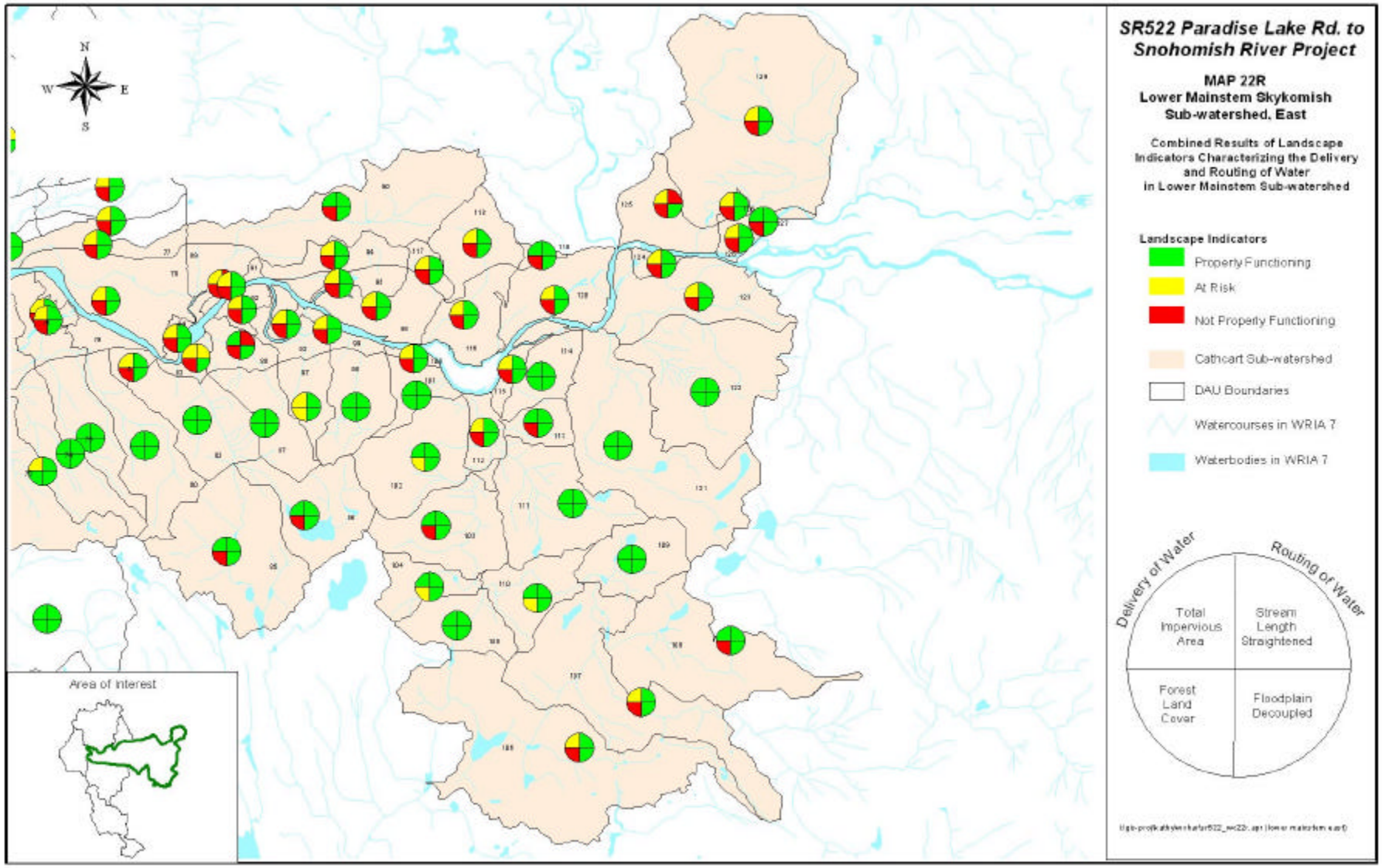
3. Quantify individual landscape indicators using GIS tools and assign a condition
   - TIA % and forest cover % using current and future land use/land cover data
   - Road density (miles/square mile)
   - Stream channel (% straightened)

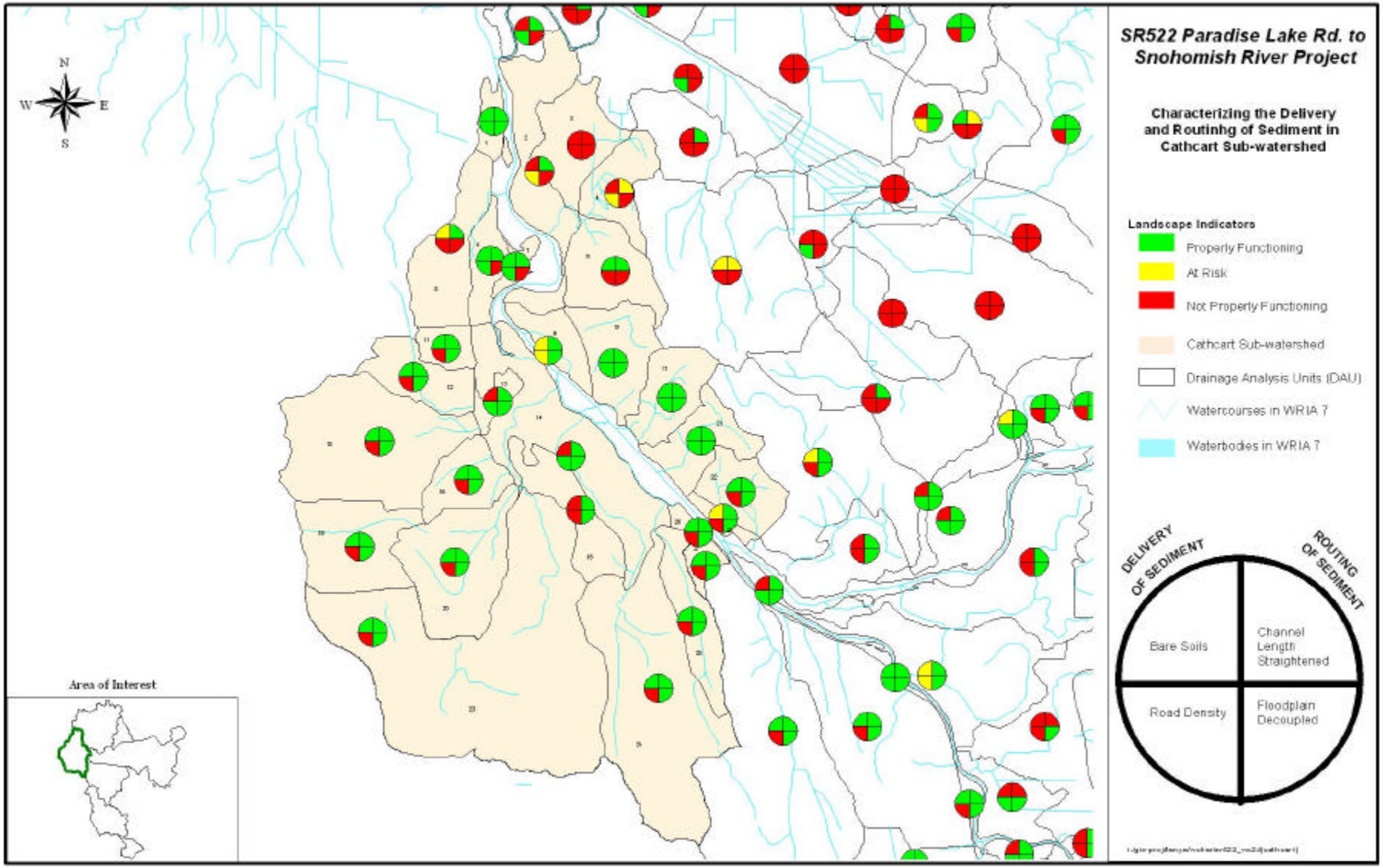
Part II, Step 4
Characterize Condition

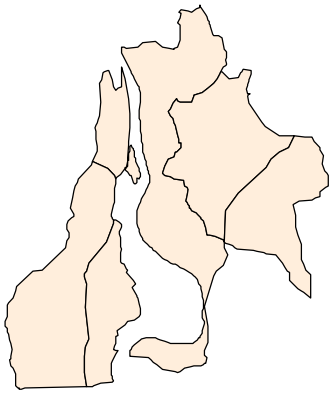
Methods

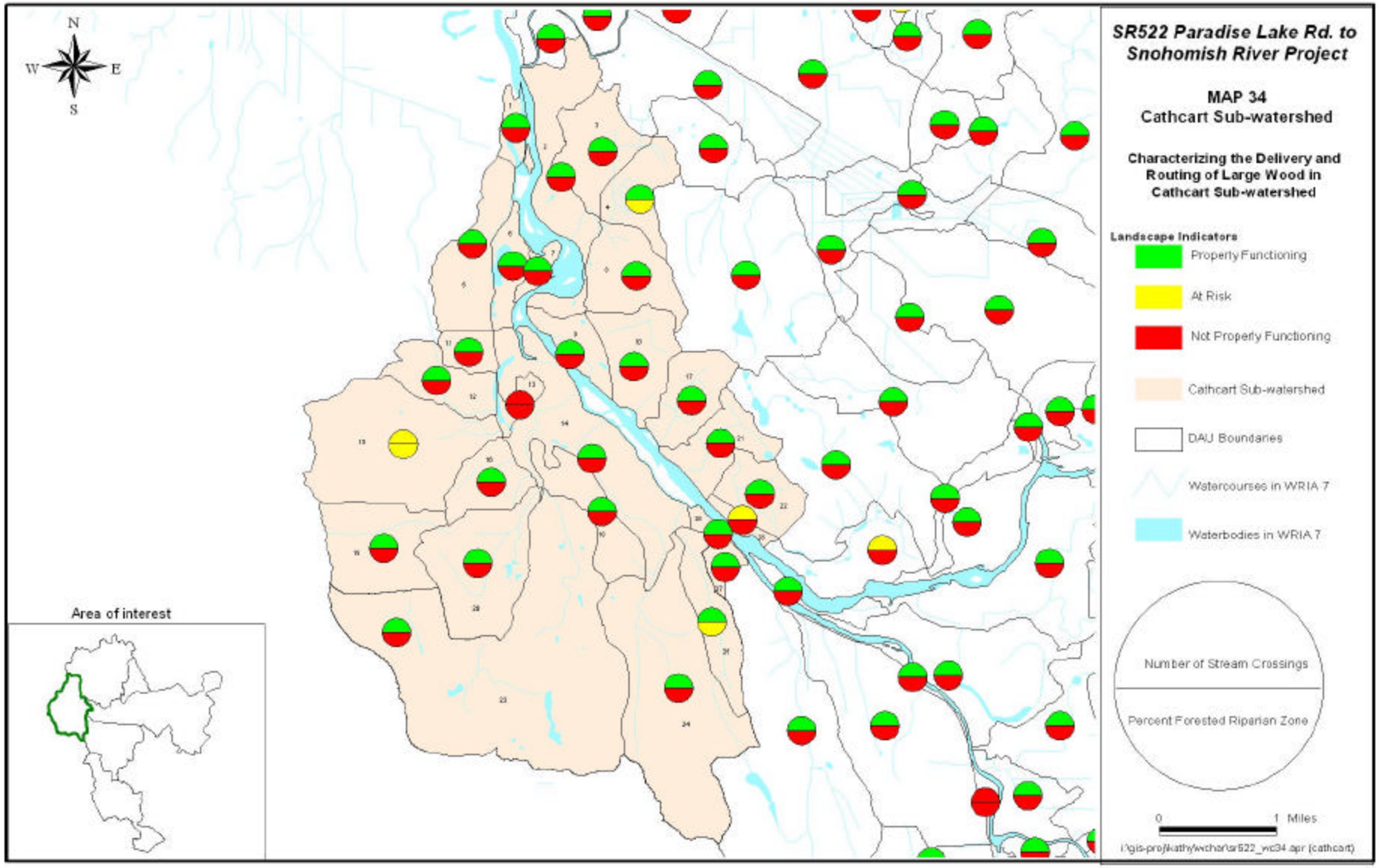
4. Establish condition rank
5. Compile results of all landscape indicators
6. Plot results onto DAUs for visual interpretation

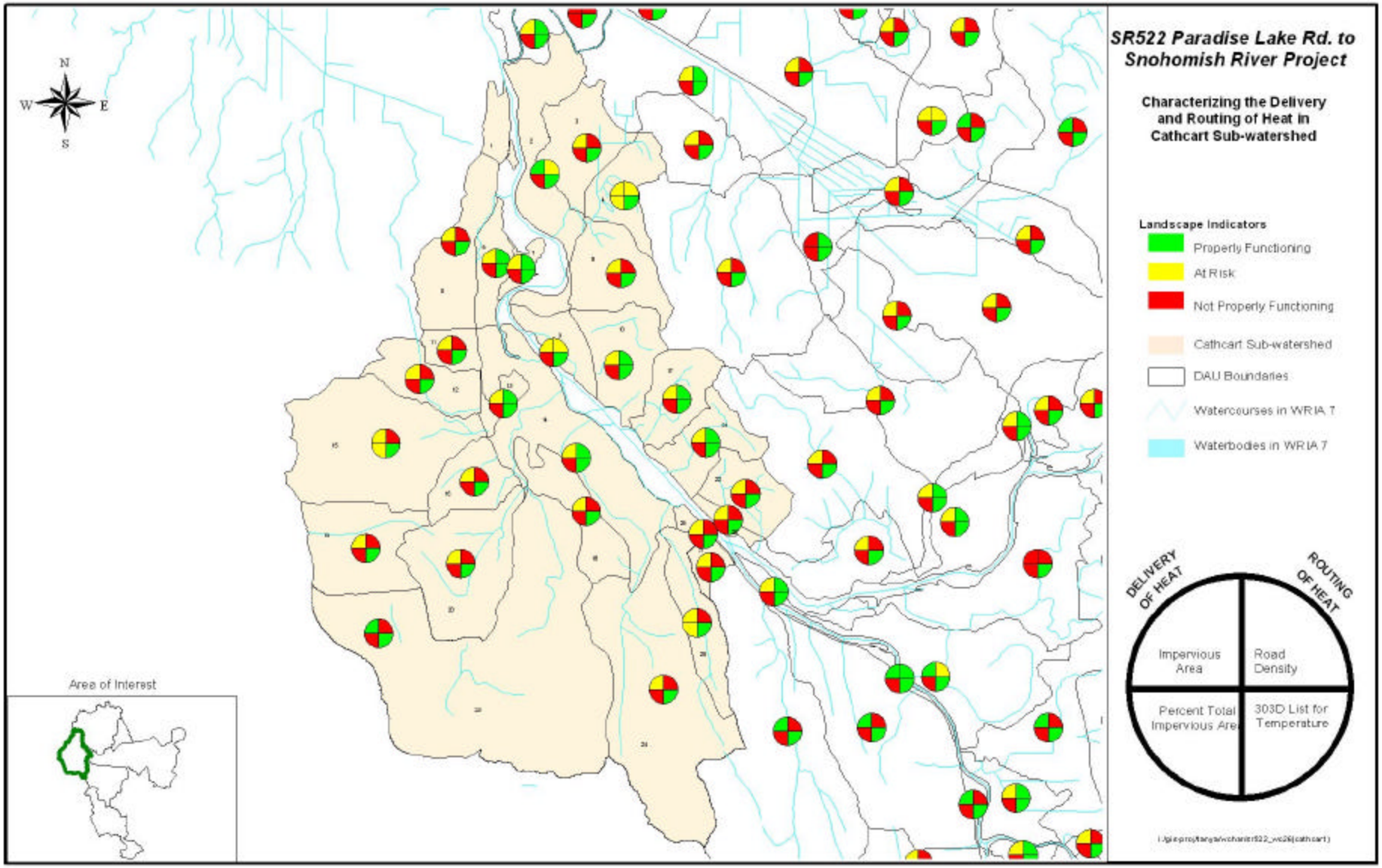

N
W
E
S
SR522 Paradise Lake Rd. to Snohomish River Project
MAP 22R
Cathcart Sub-watershed
Combined Results of Landscape Indicators Characterizing the Delivery and Routing of Water in Cathcart Sub-watershed
Landscape Indicators
Properly Functioning
At Risk
Not Properly Functioning
Cathcart Sub-watershed
DAU Boundaries
Watercourses in WRIA 7
Waterbodies in WRIA 7
Delivery of Water
Routing of Water
Total Impervious Area
Stream Length Straightened
Forest Land Cover
Floodplain Decoupled
Area of Interest


N
W
E
S
Area of interest
SR522 Paradise Lake Rd. to Snohomish River Project
MAP 22R
Lower Mainstem Skykomish Sub-watershed, East
Combined Results of Landscape Indicators Characterizing the Delivery and Routing of Water in Lower Mainstem Sub-watershed
Landscape Indicators
Properly Functioning
At Risk
Not Properly Functioning
Cathcart Sub-watershed
DAU Boundaries
Watercourses in WRIA 7
Waterbodies in WRIA 7
Delivery of Water
Routing of Water
Total Impervious Area
Stream Length Straightened
Forest Land Cover
Floodplain Decoupled


N
W
E
S
SR522 Paradise Lake Rd. to Snohomish River Project
Characterizing the Delivery and Routinhg of Sediment in Cathcart Sub-watershed
Landscape Indicators
Properly Functioning
At Risk
Not Properly Functioning
Cathcart Sub-watershed
Drainage Analysis Units (DAU)
Watercourses in WRIA 7
Waterbodies in WRIA 7
DELIVERY OF SEDIMENT
ROUTING OF SEDIMENT
Bare Soils
Channel Length Straightened
Road Density
Floodplain Decoupled
Area of Interest




N
W
E
S
Area of interest
SR522 Paradise Lake Rd. to Snohomish River Project
MAP 34
Cathcart Sub-watershed
Characterizing the Delivery and Routing of Large Wood in Cathcart Sub-watershed
Landscape Indicators
Properly Functioning
At Risk
Not Properly Functioning
Cathcart Sub-watershed
DAU Boundaries
Watercourses in WRIA 7
Waterbodies in WRIA 7
Number of Stream Crossings
Percent Forested Riparian Zone
0
1 Miles
i:\gis-proj\kathy\wchar\sr522_wc34.apr (cathcart)


N
W
E
S
SR522 Paradise Lake Rd. to Snohomish River Project
Characterizing the Delivery and Routing of Heat in Cathcart Sub-watershed
Landscape Indicators
Properly Functioning
At Risk
Not Properly Functioning
Cathcart Sub-watershed
DAU Boundaries
Watercourses in WRIA 7
Waterbodies in WRIA 7
DELIVERY OF HEAT
ROUTING OF HEAT
Impervious Area
Road Density
Percent Total Impervious Area
303D List for Temperature
Area of Interest

Part II, Step 4
Characterize Condition

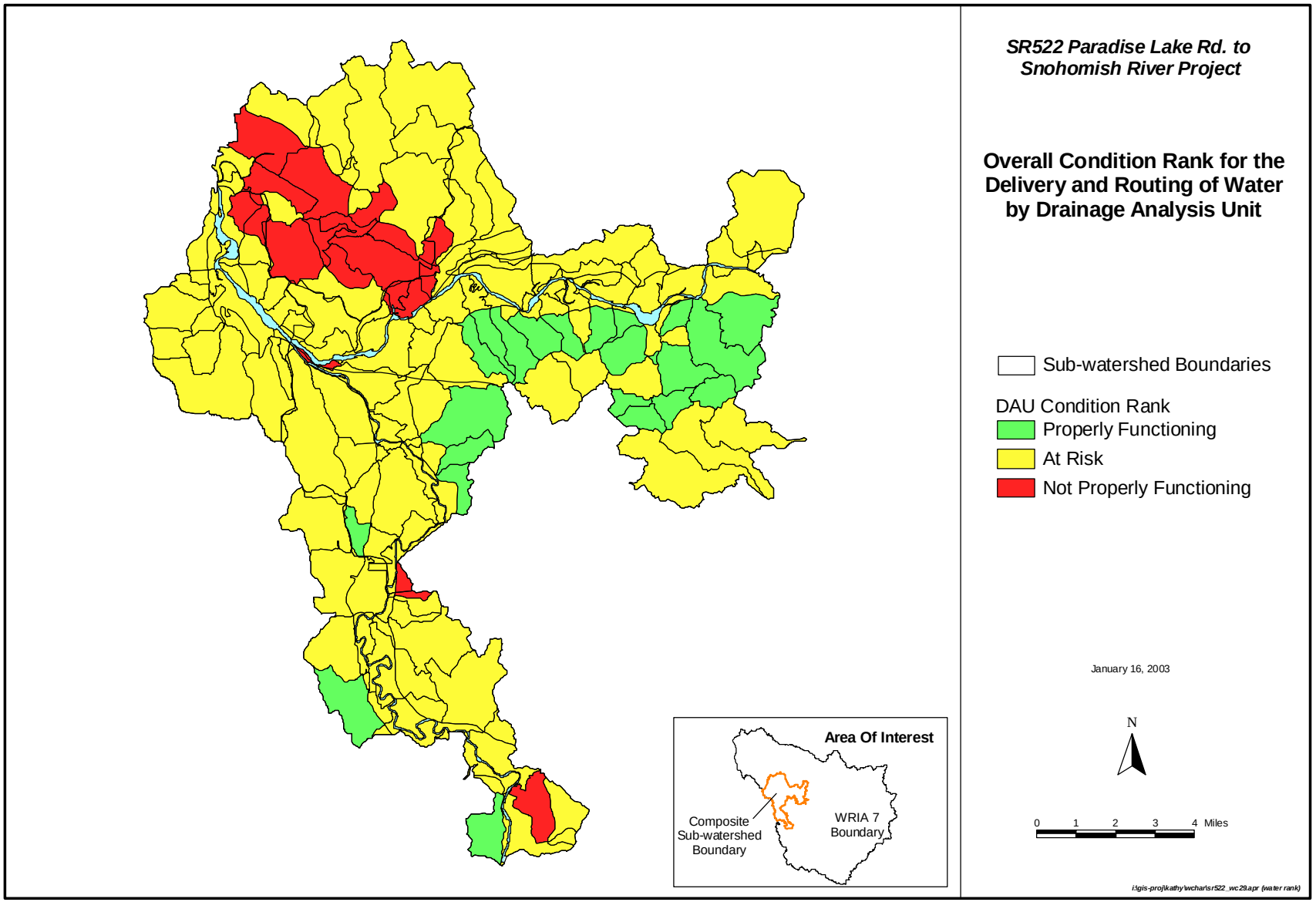
Methods

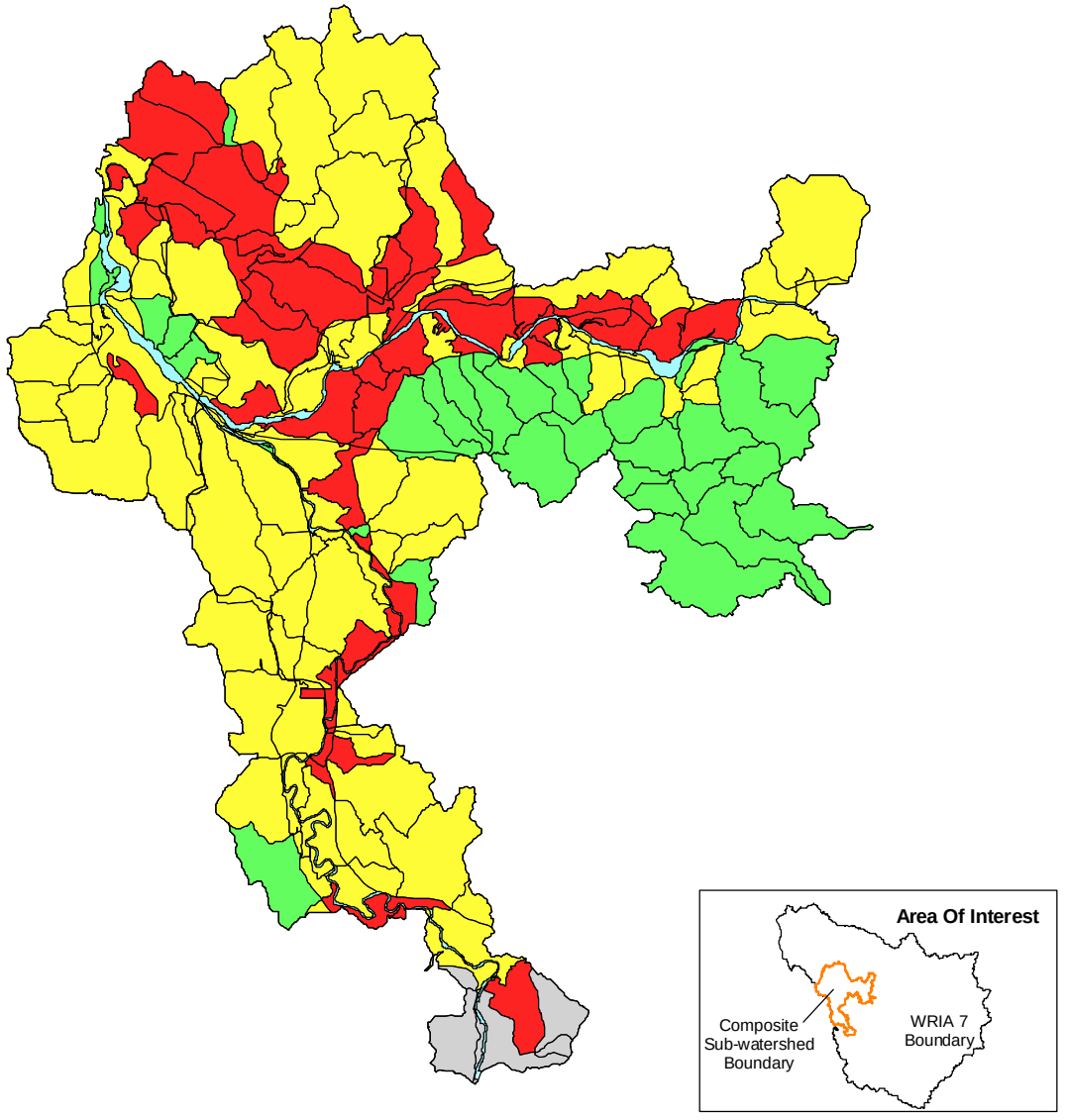
7. Team developed rules for determining overall process condition (water)
   - Effective management is source based
   - TIA % considered the strongest driver
   - Forest cover % considered second strongest
   - If TIA % is not properly functioning, then overall condition is not properly functioning

Part II, Step 4
Characterize Condition

Methods

8. Overall condition rank for each ecological process is determined


SR522 Paradise Lake Rd. to Snohomish River Project
Overall Condition Rank for the Delivery and Routing of Water by Drainage Analysis Unit
Sub-watershed Boundaries
DAU Condition Rank
Properly Functioning
At Risk
Not Properly Functioning
Area Of Interest
Composite Sub-watershed Boundary
WRIA 7 Boundary
January 16, 2003
N
0 1 2 3 4 Miles
i:\gis-proj\kathy\wcha\sr522_wc29a.pr (water rank)



SR522 Paradise Lake Rd. to Snohomish River Project

Overall Condition Rank for the Delivery and Routing of Sediment by Drainage Analysis Unit

Sub-watershed Boundaries

DAU Condition Rank

- Properly Functioning
- At Risk
- Not Properly Functioning
- NA

January 16, 2003

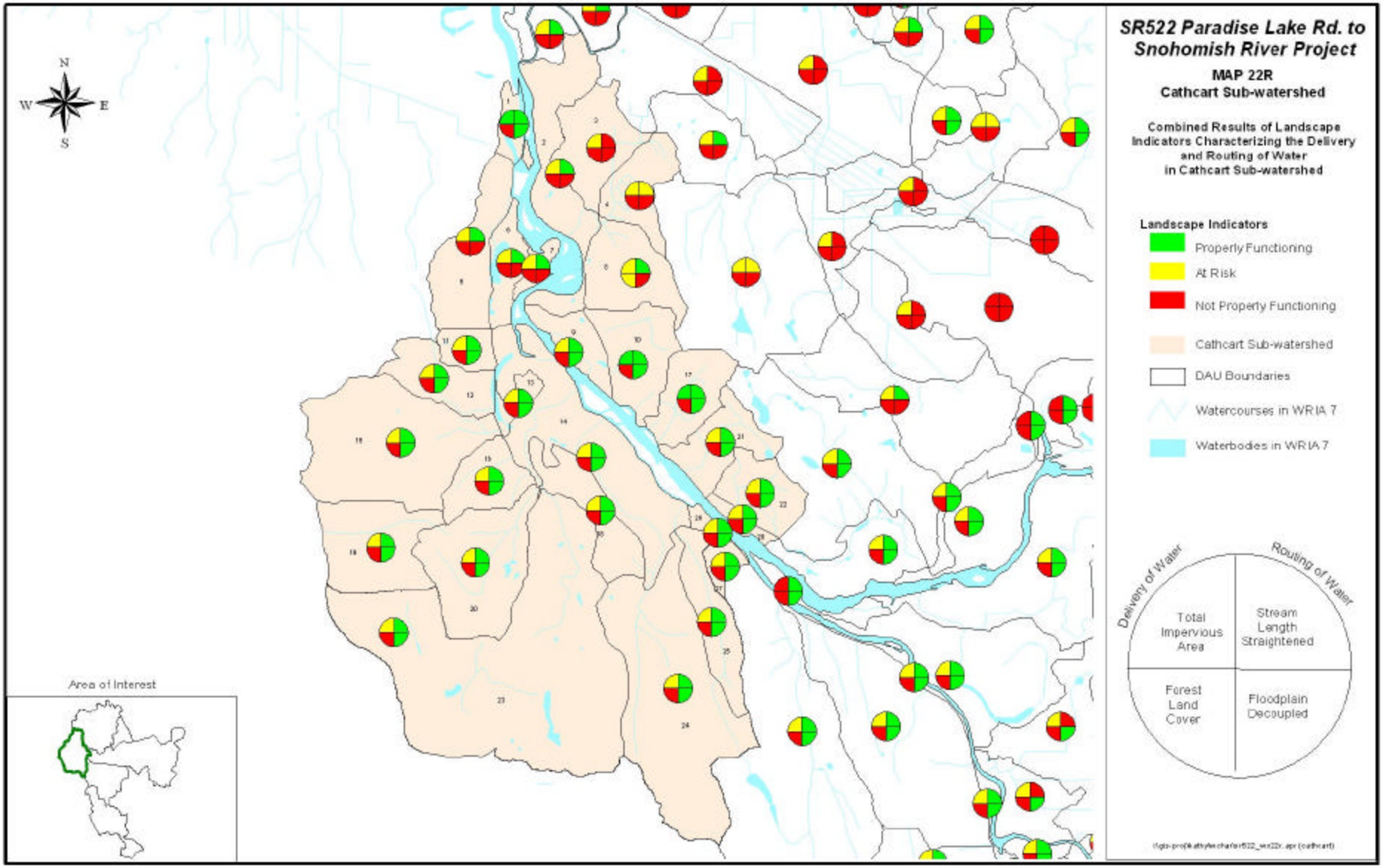
N

0 1 2 3 4 Miles

i:\gis-proj\kathy\wcha\sr522_wc29.apr (sediment rank)

Part II, Step 5

Identify Target Landscape Areas


SR522 Paradise Lake Rd. to Snohomish River Project
MAP 22R
Cathcart Sub-watershed
Combined Results of Landscape Indicators Characterizing the Delivery and Routing of Water in Cathcart Sub-watershed
Landscape Indicators
Properly Functioning
At Risk
Not Properly Functioning
Cathcart Sub-watershed
DAU Boundaries
Watercourses in WRIA 7
Waterbodies in WRIA 7
N
W
E
S
Area of Interest
Delivery of Water
Routing of Water
Total Impervious Area
Stream Length Straightened
Forest Land Cover
Floodplain Decoupled

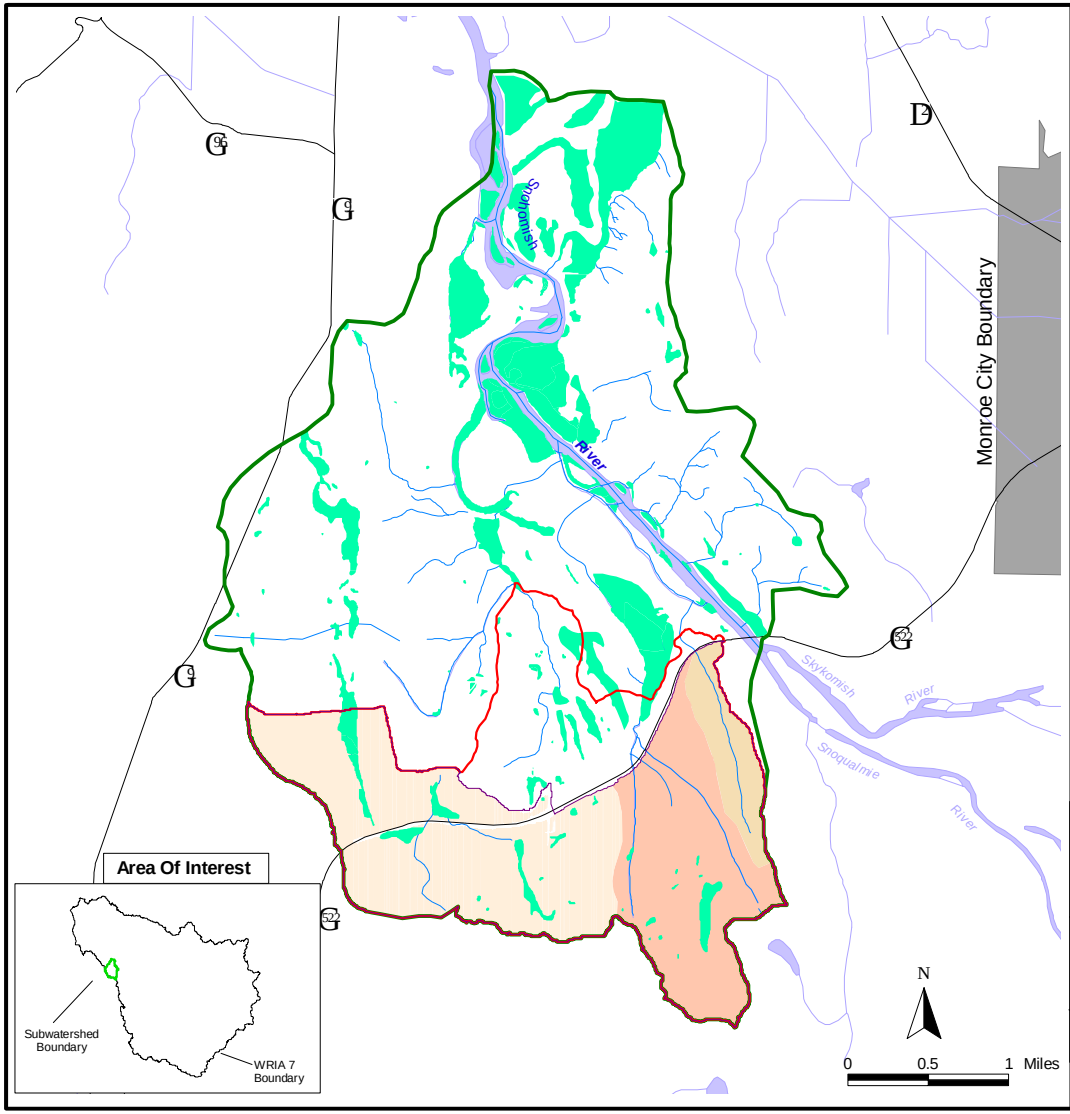
Part II, Step 5
Identify Target Areas

Delivery and routing of water drive all the other ecological processes

SR522 Paradise Lake Rd. to Snohomish River Project

Wetland Restoration Potential in the Cathcart Subwatershed

December 18, 2002



- Streams
- State Routes
- Sub-watershed Boundary
- Wetland Restoration
- Evans Creek Drainage
- Anderson Creek Drainage
- Elliott Creek Drainage
- Assessment Area
- Upslope Area
- City of Monroe
- Water Bodies

	Wetland Sites	Wetland Acreage	Unit Acreage
Elliott	0	0	
Anderson	11	27.98	
Evans	15	76.63	
Upslope Drainage	28	106.03	
Elliott	0	0	249.70
Anderson	18	53.02	1,115.39
Evans	36	131.81	2,028.83
Assessment Area	53	184.67	3,393
Cathcart Subwatershed	159	1,396.92	10,476.03

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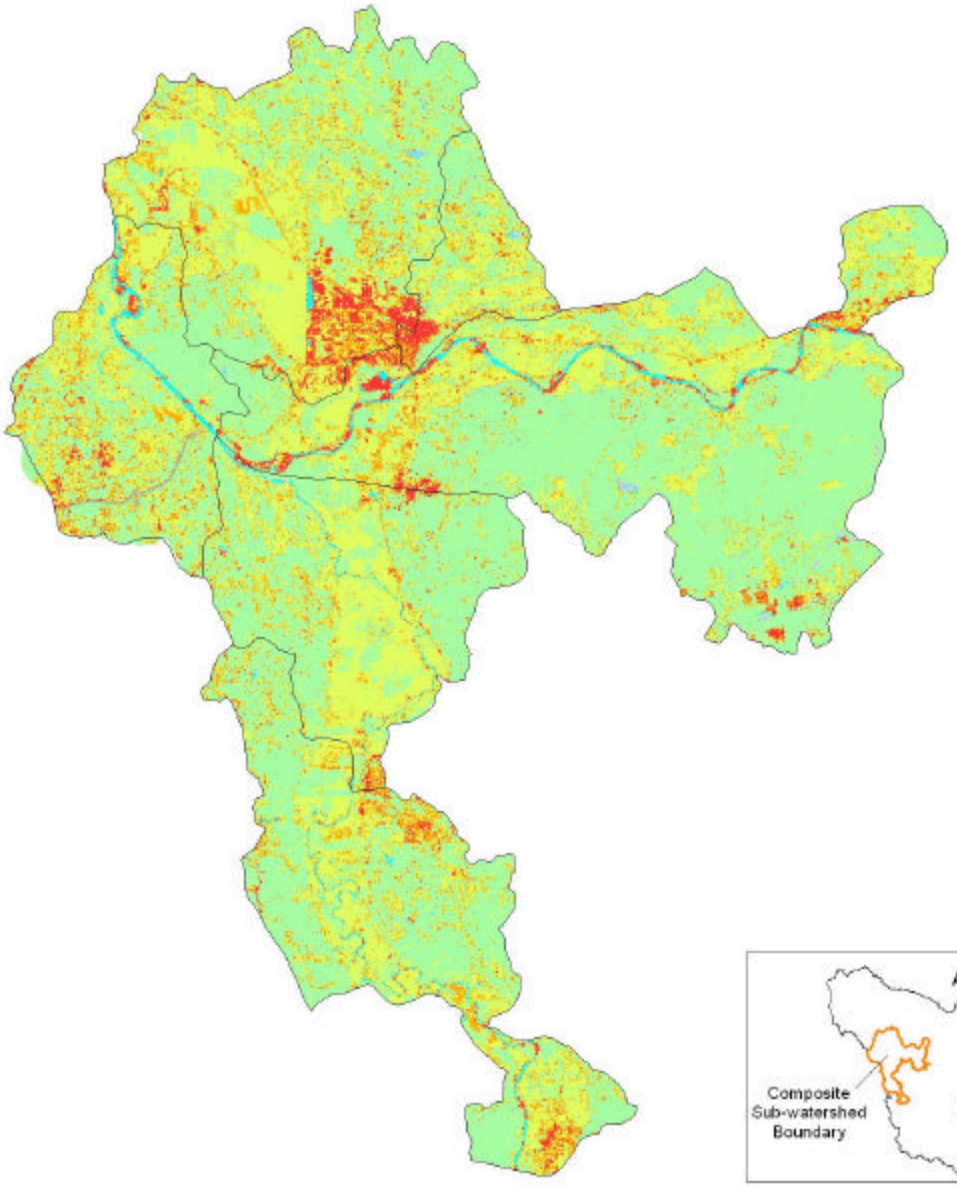
Part II, Step 5
Identify Target Areas

Extent of wetlands, percent impervious area, and forest cover determine ecological condition

SR522 Paradise Lake Rd. to Snohomish River Project

Current Land Use Intensity in the Composite Sub-watershed



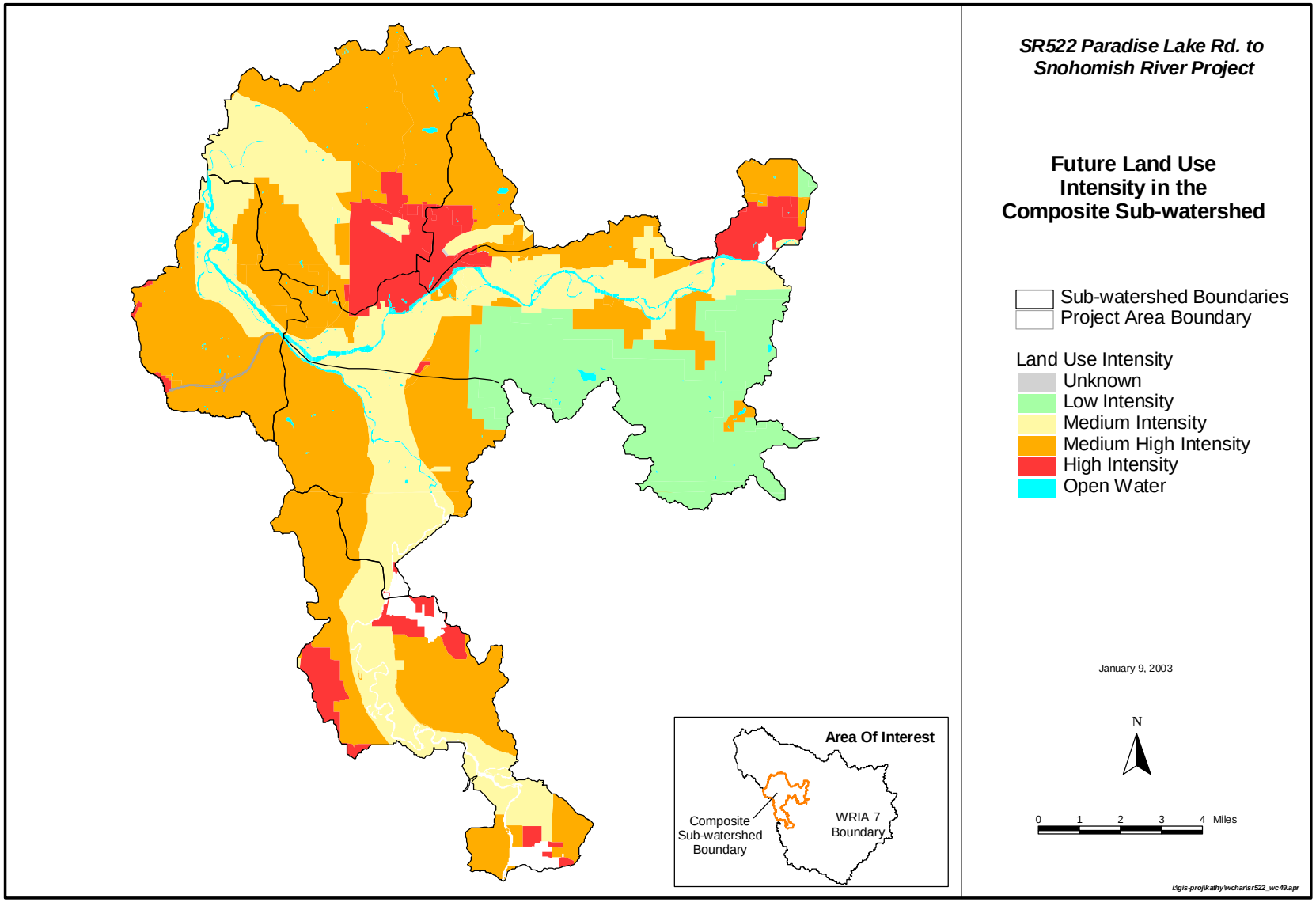
Sub-watershed Boundaries
Project Area Boundary

Land Use Intensity
- Unknown/No Data
- Low Intensity
- Medium Low Intensity
- Medium High Intensity
- High Intensity
- Open Water

January 9, 2003

N

0 1 2 3 4 Miles


SR522 Paradise Lake Rd. to Snohomish River Project
Future Land Use Intensity in the Composite Sub-watershed
Sub-watershed Boundaries
Project Area Boundary
Land Use Intensity
Unknown
Low Intensity
Medium Intensity
Medium High Intensity
High Intensity
Open Water
Area Of Interest
Composite Sub-watershed Boundary
WRIA 7 Boundary
January 9, 2003
N
0 1 2 3 4 Miles
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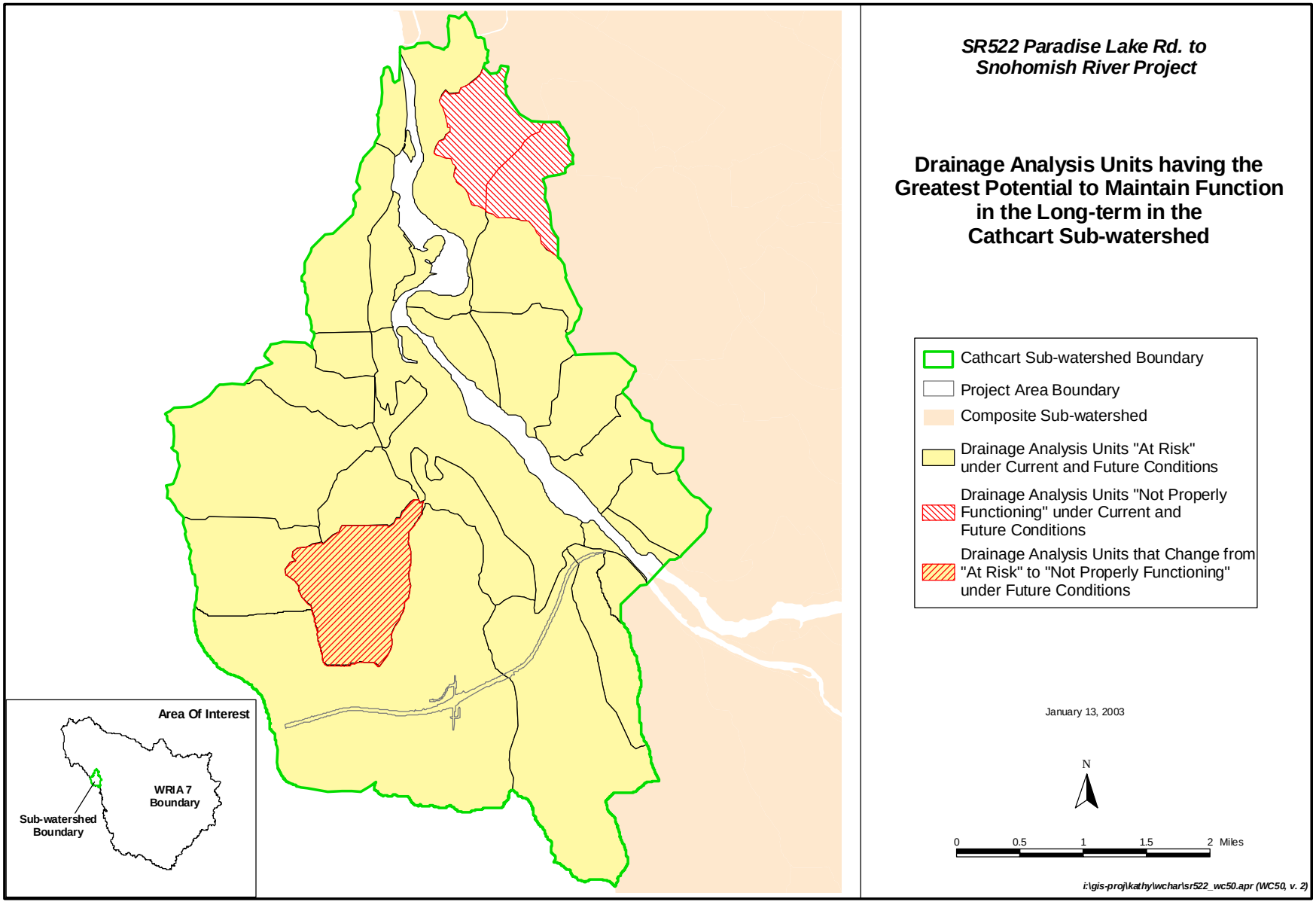
Part II, Step 5
Identify Target Areas

It is essential that watershed characterization include current land-use data. New data sets may be needed.



SR522 Paradise Lake Rd. to Snohomish River Project

Drainage Analysis Units having the Greatest Potential to Maintain Function in the Long-term in the Cathcart Sub-watershed

- Cathcart Sub-watershed Boundary
- Project Area Boundary
- Composite Sub-watershed
- Drainage Analysis Units "At Risk" under Current and Future Conditions
- Drainage Analysis Units "Not Properly Functioning" under Current and Future Conditions
- Drainage Analysis Units that Change from "At Risk" to "Not Properly Functioning" under Future Conditions

January 13, 2003

N

0 0.5 1 1.5 2 Miles

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Part II, Step 5
Identify Target Areas

We can meet stormwater and wetland mitigation needs within the upslope drainages, the assessment area, and the Cathcart sub-watershed

Part II, Step 6

Identify Target Resource Areas

Part II, Step 6
Local Priority Areas

- Builds on Step 5
- Identifies local / regional priorities
- Includes state agency watershed efforts
  - 303(d) List
  - TMDLs

Part II, Step 6
Local Priority Areas

Methods:

- Use reports and watershed plans
- Communicate with local planning groups
- Tabulate local priorities
- Map priority areas for mitigation needs overlap

Part II, Step 6
Local Priority Areas

Questions to be Answered:

Where are local priority recovery areas for…

- Fish and wildlife habitat?
- Water quality?
- Water quantity?

Fish and Wildlife Habitat

Three sources were consulted:

- *Chinook Salmon Near Term Action Agenda (published)*
- *Snohomish River Basin Conditions and Issues Report (published)*
- *Lower Skykomish Habitat Conservation Group (informal discussion)*

Water Quality

Identify local water quality priorities:

- 303(d) listed water bodies
- Water quality recovery areas from two TMDLs:
  - "Snohomish River Tributaries"
  - "Snohomish River Estuary"

TMDLs

- Parts of composite sub-watershed included
  - Woods and French Creeks, Snohomish River
- Implementing TMDLs:
  - Follow State Nonpoint Source Management Plan
  - Cooperate and coordinate with local agencies
  - Follow local watershed plans
  - Monitor compliance with NPDES permits

Water Quantity

- Increased peak flows, declining base flows
- No “2514” water quantity planning started
- No local water quantity priorities identified

Part II, Step 6
Local Priority Areas

Combine Priority Recovery Areas

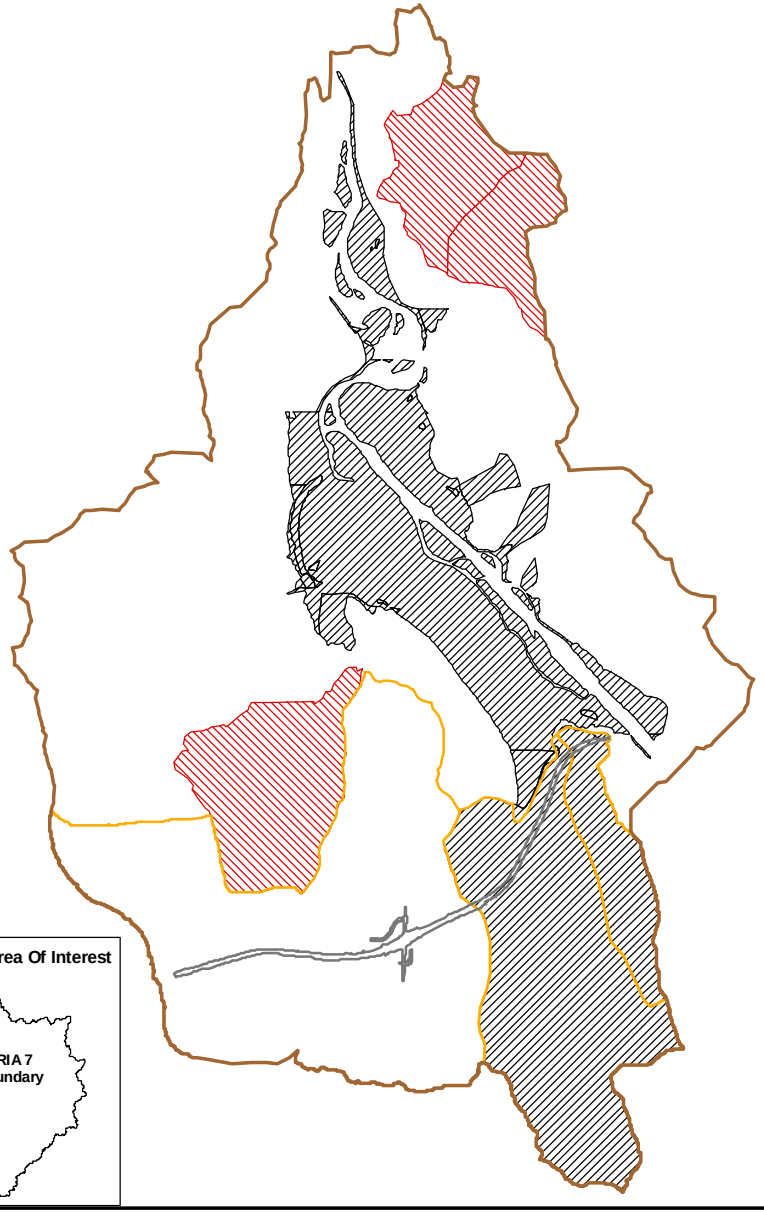
- Limit to Cathcart Subwatershed (to conform with other steps)
- Merge data into one GIS coverage
- Coverage will identify all local priorities

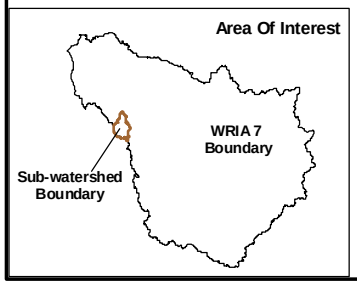
Examples of Merged Priorities

- Lake Beecher:
  Floodplain connectivity, riparian restoration
- Elliott and Anderson Creeks:
  Acquisition, in-stream passage, riparian restoration, LWD
- Mainstem Snohomish floodplain tributaries / side channels:
  Naturalize channels, establish forested buffers

SR522 Paradise Lake Rd. to Snohomish River Project

Local Priority Recovery Areas in the Cathcart Sub-watershed





Project Area
Assessment Area Drainage Boundaries
Cathcart Sub-watershed Boundary

DAUs out of Consideration Due to Current and/or Future Conditions

Local Priority Recovery Areas
Fish Habitat

January 31, 2003

N

0 0.5 1 1.5 2 Miles

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Step 7

Identify Candidate Mitigation Sites

Part II, Step 7
Candidate Mitigation Sites

Potential Restoration Areas

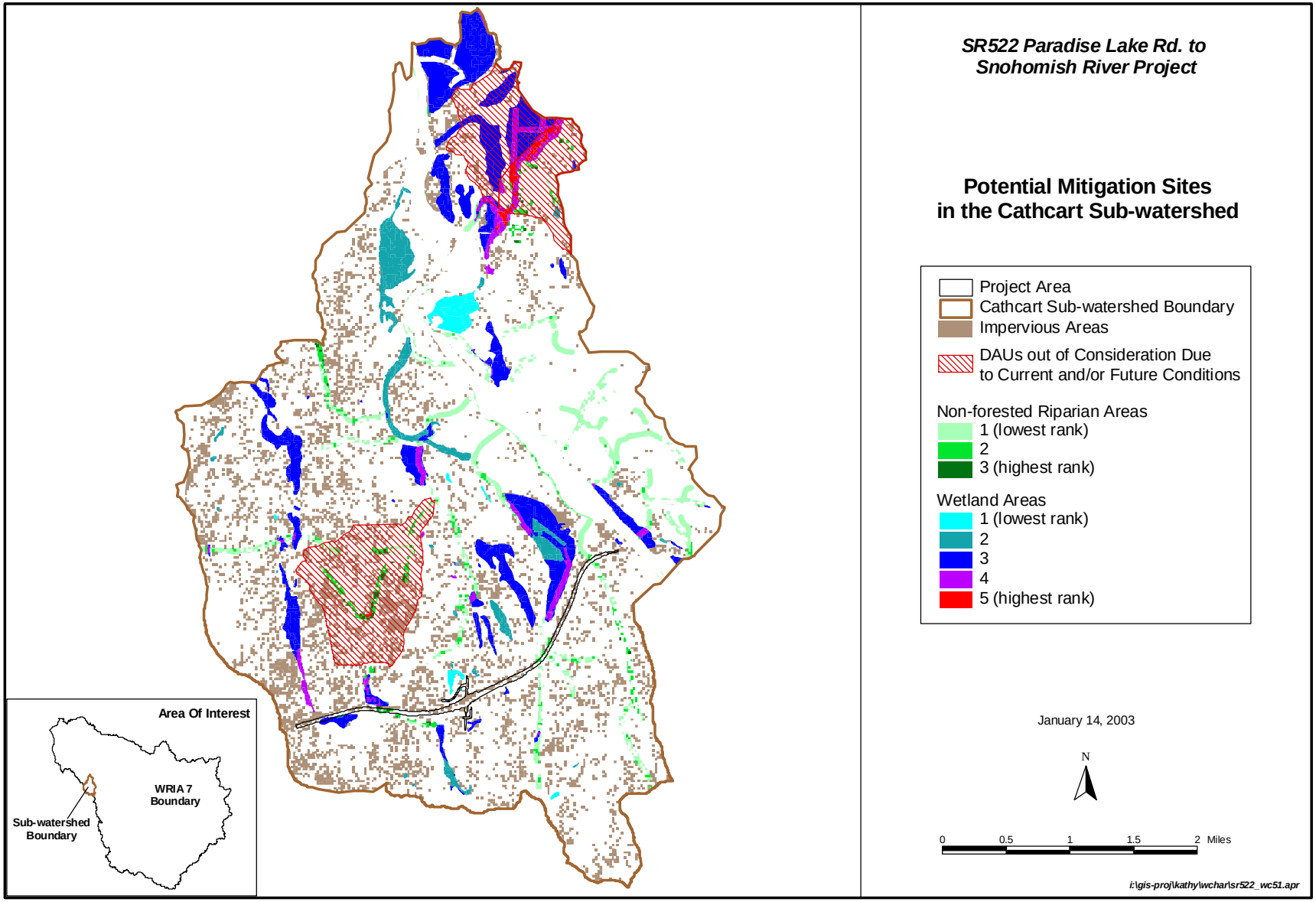
- Wetland Restoration
- Upland Depressions
- Riparian Reforestation
- Impervious Surface Removal

Potential Restoration Areas in the Cathcart Subwatershed

Landscape Feature	Restoration Area Available (acres)					
	Upslope Area				Assess-ment Area	Cathcart Sub-watershed
	EF Evans	Anderson	Elliott	Total		
Wetland Restoration	77	28	0	105	185	1345
Upland Depressions	0	0	0	0	0	123
Riparian Reforestation	14	36	14	64	102	497
Impervious Surface Removal	350	149	36	535	697	1750

Potential Storage Volumes Available in the Cathcart Subwatershed

Landscape Feature	Unit Storage (ac-ft/ac)	Storage Available (acre-feet)					
		Upslope Area				Assess-ment Area	Cathcart Sub-watershed
		EF Evans	Anderson	Elliott	Total		
Wetland Restoration	1.33	102	37	0	139	246	1789
Upland Depressions	1.33	0	0	0	0	0	163
Riparian Reforest.	0.12	1.7	4.3	1.7	7.7	12.2	59.6
Impervious Surface Removal	0.61	213	91	22	326	425	1067
TOTAL		317	132	24	473	683	3079
STORAGE NEEDED		25	8.7	1.5	35	35	35


SR522 Paradise Lake Rd. to Snohomish River Project
Potential Mitigation Sites in the Cathcart Sub-watershed
Project Area
Cathcart Sub-watershed Boundary
Impervious Areas
DAUs out of Consideration Due to Current and/or Future Conditions
Non-forested Riparian Areas
1 (lowest rank)
2
3 (highest rank)
Wetland Areas
1 (lowest rank)
2
3
4
5 (highest rank)
Area Of Interest
WRIA 7 Boundary
Sub-watershed Boundary
January 14, 2003
N
0 0.5 1 1.5 2 Miles
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Water Quality

Enhanced water quality treatment standards can be met with upslope restoration activities and BMP treatment of runoff within the project right-of-way

Conclusions

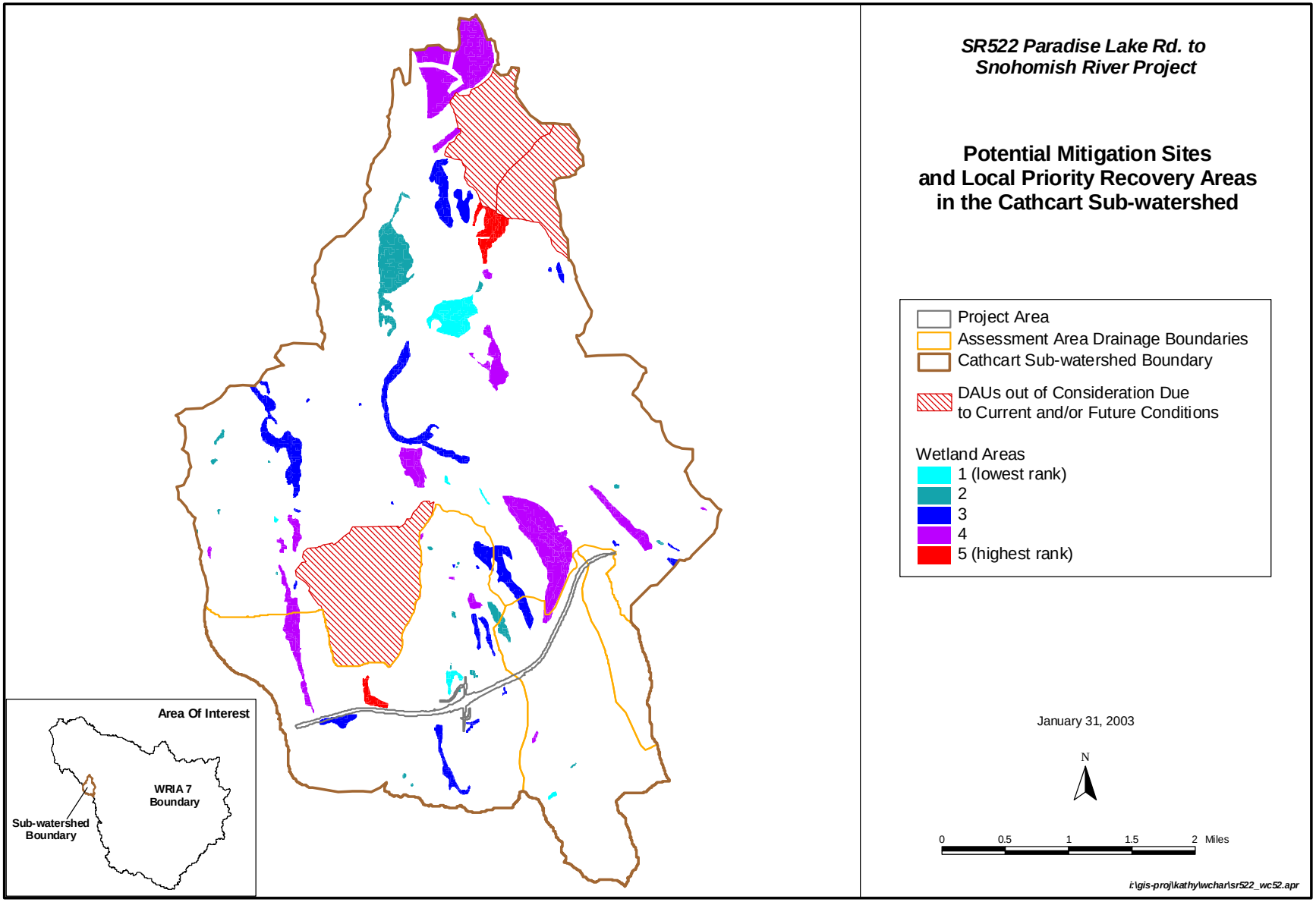
1. Priority Mitigation Options
2. Lessons Learned

Cumulative Effects

- **Has been described as death by 1000 cuts**
- **The solution is not 1000 bandages**
- **We must maximize the opportunities and resources we have**
- **Mitigation starts with “do no further harm” and ends with maximizing mitigation potential**

Characterization Product

A series of ranked or prioritized potential mitigation sites that the regional transportation project team can select from.


SR522 Paradise Lake Rd. to Snohomish River Project
Potential Mitigation Sites and Local Priority Recovery Areas in the Cathcart Sub-watershed
Project Area
Assessment Area Drainage Boundaries
Cathcart Sub-watershed Boundary
DAUs out of Consideration Due to Current and/or Future Conditions
Wetland Areas
1 (lowest rank)
2
3
4
5 (highest rank)
Area Of Interest
WRIA 7 Boundary
Sub-watershed Boundary
January 31, 2003
N
0
0.5
1
1.5
2
Miles
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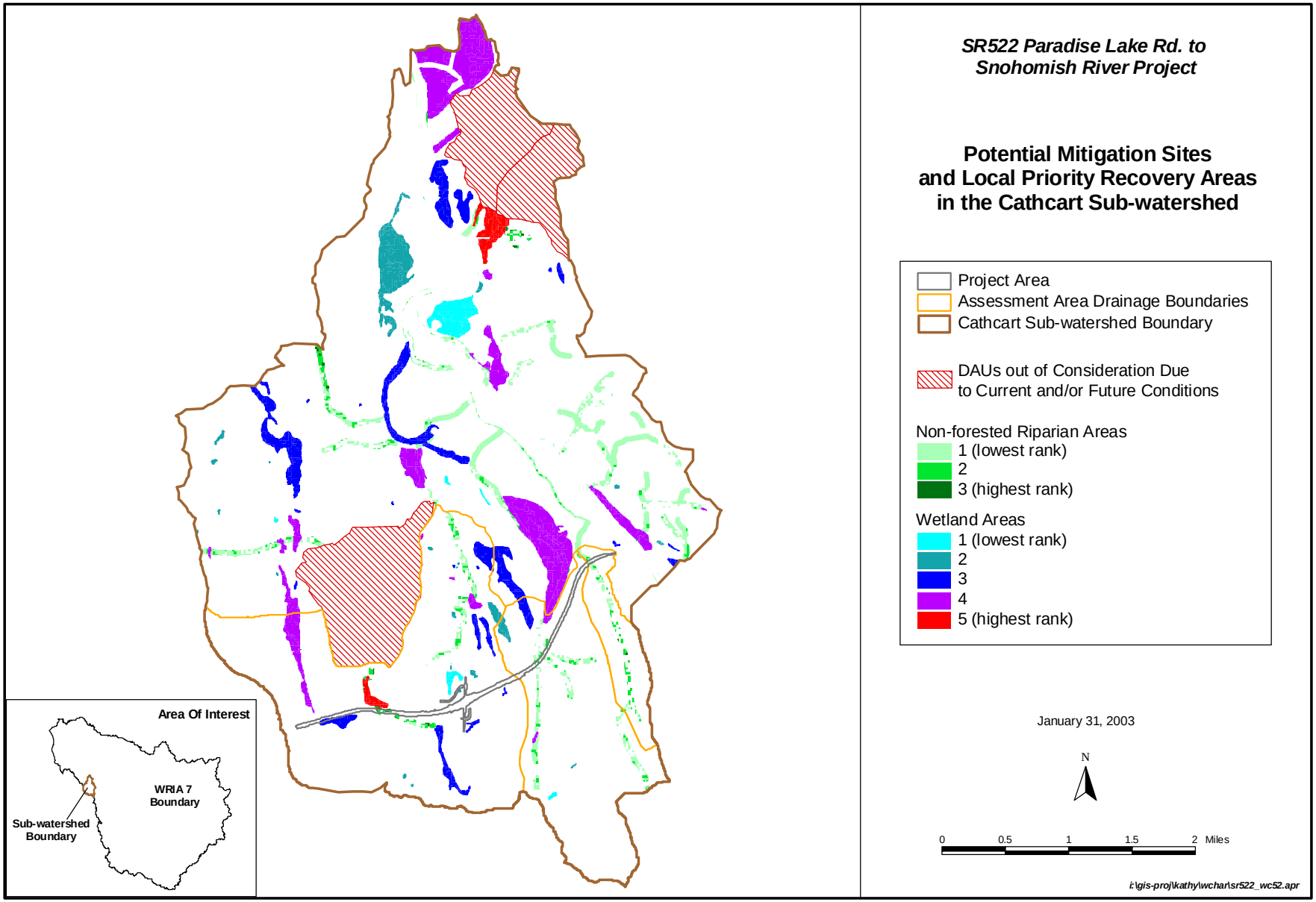

SR522 Paradise Lake Rd. to Snohomish River Project

Potential Mitigation Sites and Local Priority Recovery Areas in the Cathcart Sub-watershed

Project Area
Assessment Area Drainage Boundaries
Cathcart Sub-watershed Boundary

DAUs out of Consideration Due to Current and/or Future Conditions

Non-forested Riparian Areas
1 (lowest rank)
2
3 (highest rank)

Wetland Areas
1 (lowest rank)
2
3
4
5 (highest rank)

January 31, 2003

N

0 0.5 1 1.5 2 Miles

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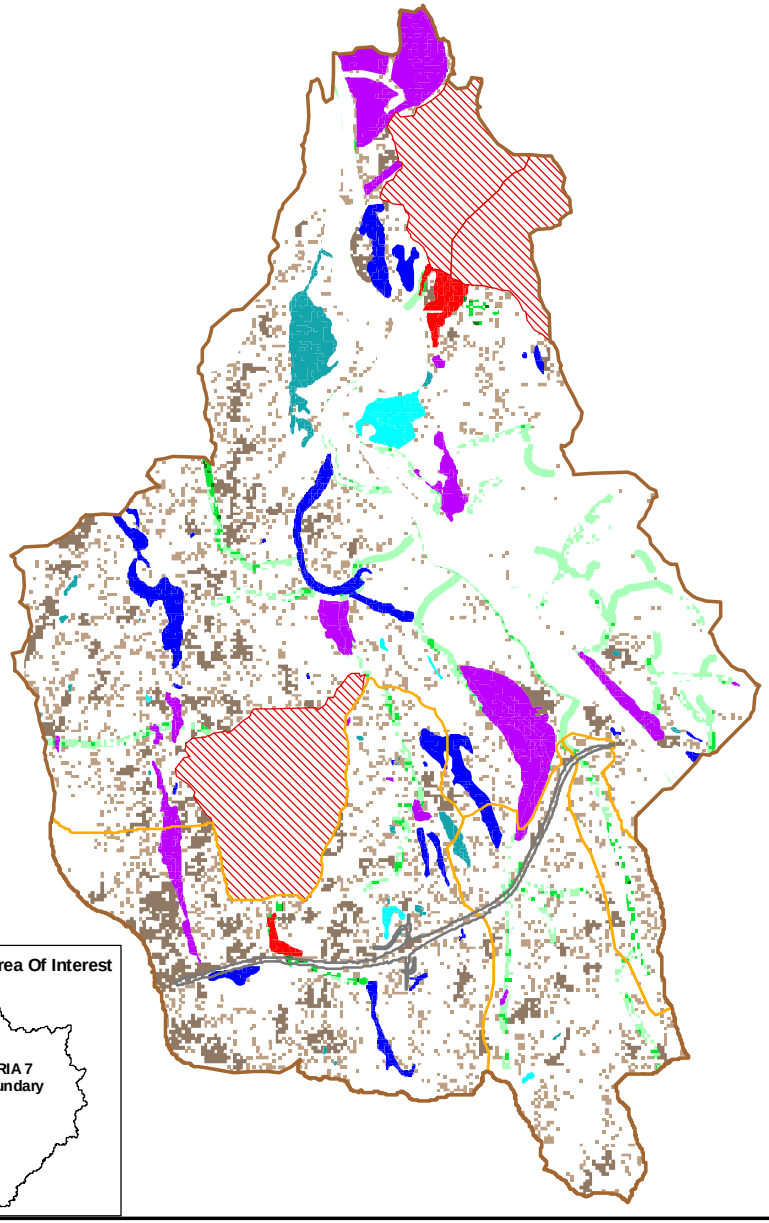
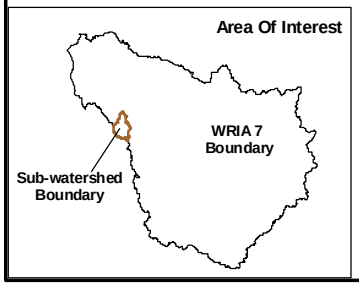
SR522 Paradise Lake Rd. to Snohomish River Project

Potential Mitigation Sites and Local Priority Recovery Areas in the Cathcart Sub-watershed





- Project Area
- Assessment Area Drainage Boundaries
- Cathcart Sub-watershed Boundary
- DAUs out of Consideration Due to Current and/or Future Conditions
- Impervious Areas
- Impervious Areas Greater than 2 Acres

Non-forested Riparian Areas
- 1 (lowest rank)
- 2
- 3 (highest rank)

Wetland Areas
- 1 (lowest rank)
- 2
- 3
- 4
- 5 (highest rank)

January 31, 2003

N

0 0.5 1 1.5 2 Miles

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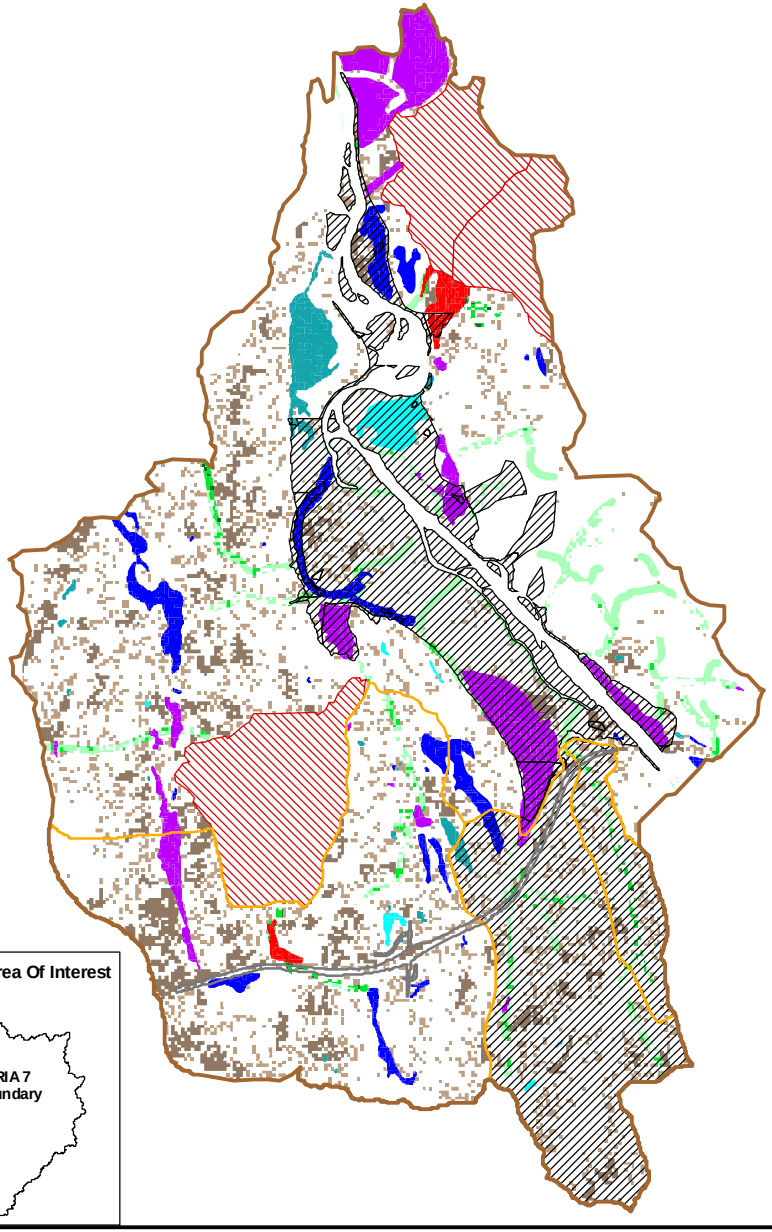

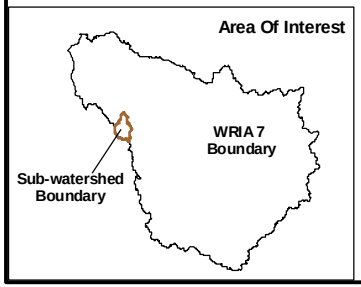

SR522 Paradise Lake Rd. to Snohomish River Project

Potential Mitigation Sites and Local Priority Recovery Areas in the Cathcart Sub-watershed

- Project Area
- Assessment Area Drainage Boundaries
- Cathcart Sub-watershed Boundary
- DAUs out of Consideration Due to Current and/or Future Conditions
- Impervious Areas
- Impervious Areas Greater than 2 Acres

Local Priority Recovery Areas
- Fish Habitat

Non-forested Riparian Areas
- 1 (lowest rank)
- 2
- 3 (highest rank)

Wetland Areas
- 1 (lowest rank)
- 2
- 3
- 4
- 5 (highest rank)

January 31, 2003

N

0 0.5 1 1.5 2 Miles

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Lessons Learned

While the SR 522 project is taking untested concepts and putting them into action, there is substantial work to be done to refine methods

Lessons Learned

An interdisciplinary technical team is essential to the development, assessment, and interpretation of watershed characterization tools

Lessons Learned

Adequate GIS support is needed to complete watershed characterization projects

Lessons Learned

To develop methods most efficiently, key permitting agency staff must work directly on the technical team

Lessons Learned

Local coordination is an intrinsic part of the watershed characterization process and needs to begin at the earliest stages in the process

Lessons Learned

Watershed characterization concepts/tools need to be integrated into existing policy, when finalized

Lessons Learned

Mitigation in advance of a project will require non-project funding sources

Lessons Learned

An understanding of surface water/groundwater relationships is essential to adequately assessing and mitigating transportation impacts to water movement

Lessons Learned

Current land use/land cover data are essential to any watershed assessment effort

Lessons Learned

Appropriate spatial scales for watershed characterization will vary and are dependent on landscape position and surrounding land use

Lessons Learned

There is substantial value in developing a 6-year transportation plan screening tool that evaluates and identifies projects that would benefit from watershed characterization

Lessons Learned

There is value in WSDOT Environmental Staff participating/cooperating in targeted local watershed planning efforts

Lessons Learned

To minimize financial risk to WSDOT, policy guidelines should be developed regarding mitigation in advance of project funding